Board Approves Research Recommendations

The Foundation's Board of Directors met in early 2023 to review and approve an ambitious research agenda. The Foundation's Research Advisory Committee recommended eleven projects focused on finding solutions to improve food safety with an emphasis on *Salmonella* in pork and beef products; providing alternative support for Appendices A&B; identifying the role meat and poultry play in supporting health outcomes; and determining if a stress induced gene impacts beef quality. Information on the approved and initiated projects can be found in the research project summaries section of the newsletter.

White House Conference Challenge

In March, as part of the White House Conference on Hunger, Nutrition, and Health, the White House launched the "Challenge to End Hunger and Build Healthy Communities". Through this Challenge, the Administration is encouraging stakeholders across all sectors of society to make bold and impactful commitments that will collectively achieve the goal the President set out: end hunger and increase healthy eating and physical activity by 2030 so fewer Americans experience diet-related diseases – all while reducing disparities.

Actions taken under the Challenge will help drive progress in implementing the National Strategy on Hunger, Nutrition, and Health. The Challenge also builds off the success of the first call to action the Administration made and the commitments that were announced at the Conference.

The requested commitments through the Challenge are more targeted across all five pillars. In Pillar 5: Enhance Nutrition and Food Security Research, commitments are sought to fill nutrition research gaps to continue to support the Dietary Guidelines for Americans. Academic institutions, research foundations, and philanthropic groups are encouraged to invest in research on the diet and health of older adults, during pregnancy, and birth to 24 months; to invest in longitudinal studies on dietary exposures and interactions with health outcomes throughout life stages; and to better understand nutritional needs across underserved populations, including Native Americans, to advance health equity.

Information on the Challenge and making commitments is available on the White House Conference website.

## Consumer Food Safety Education Conference Wrap Up

The Beef Checkoff, through its contract with the Foundation, sponsored the Partnership for Food Safety Education's Consumer Food Safety Education Conference on March 1-3, 2023 in Arlington, VA. The conference was attended by 200 food safety educators and communicators; public health and environmental health professionals; cooperative extension specialists; registered dietitians and nutrition processionals; among others. As a sponsor, the Beef Checkoff was provided an opportunity to share post-harvest beef safety research conducted on behalf of the Beef Checkoff and engage with attendees directly.

Power Of Meat

The Foundation and [FMI—The Food Industry Association](#) released the 18th annual Power of Meat[1] report, a retail consumer study conducted by 210 Analytics.

The report found Americans are buying more fresh meat than before the COVID-19 pandemic and are seeking value in terms of price, convenience and better-for attributes in meat purchases. Self-described "meat eaters" comprise 78% of Americans, compared to just 7% who describe themselves as vegan or vegetarian. Shoppers spend more than $15 in the meat department per trip and average nearly one trip to the meat department per week (up nearly 5% since 2019). Despite rising food and beverage prices over the past year, consumers did not significantly change the amount of meat they buy (down just 2.5% by volume compared to 2021). Product quality and appearance continue to be the top factors driving meat purchase decisions, followed by price per pound and total package price.

In line with overall shopper interest in healthy and nutritious food choices (63%) and in doing their part for the environment (52%), 85% of meat shoppers consider at least one "better-for" attribute when buying meat (better for me/my family, better for animals, better for the planet, better for farmers/workers). Shoppers weighing health and nutrition in their meat and poultry purchases are focused on three areas: portion control, lean percentage and protein variety in the form of seafood.
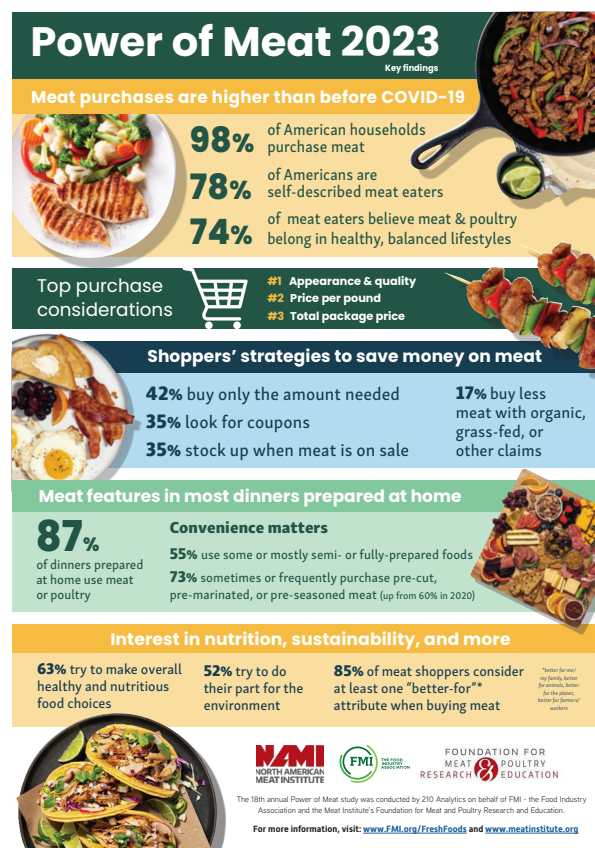
Click here to expand the Power of Meat infographic online.

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1   210 Analytics. 2023 The Power of Meat: An in-depth look at meat through the shopper's eyes. FMI – The Food Industry Association and Foundation for Meat and Poultry Research and Education.

Recent Findings from Beef Checkoff Funded Research Administered by the Foundation

Evidence-based, quantitative risk assessment to control salmonellosis attributable to ground beef: Evaluating and mitigating the contribution of lymph nodes to *Salmonella* contamination, University of Nebraska-Lincoln, U.S. Meat Animal Research Center, USDA ARS, Michigan State University, The University of Vermont, University of California

This project characterized the distribution of both prevalence and concentration of *Salmonella* enterica in bovine deep tissue lymph nodes (DTLNs) by lymph node type, production source, region and season using systematic review and meta-analysis approaches. The relative contributions of DTLNs and the efficacy of their removal at processing on salmonellosis risk associated with ground beef consumption were evaluated using a quantitative microbial risk assessment approach.

Using empirical evidence, modeling, and risk assessment methods to estimate the public health impact of incorporating enumeration and virulence as part of the criteria for evaluation of *Salmonella* contamination in ground beef in the US, EpiX Analytics, Colorado State University

The EpiX analytics team incorporated novel genomics methods into a fully quantitative risk assessment.The genomics methods allowed for the identification and differential targeting of *Salmonella* serovars into higher- and lower-virulence groups. The results of the risk assessment show that considering quantitative criteria to target higher virulence serovars combined with high rates of combo testing can significantly reduce human salmonellosis. Although low virulence serovars cause salmonellosis, targeting these serovars only slightly improved the reduction of illnesses. Using modeling, *Salmonella* prevalence in beef products significantly increased along with the number of cattle coming from the Southwest and Midwest regions. Additionally, prevalence was significantly higher in the summer and increased with the distance cattle traveled from source to slaughter. There were no significant associations between region or season with high-virulence *Salmonella* serovars.

Recent Findings from Research Funded in Part by the Foundation and Beef Checkoff

Effect of clean label antimicrobials on the inhibition of *Clostridium perfringens* and *Bacillus cereus* during extended cooling of uncured beef and poultry products, University of Wisconsin-Madison, Cargill

This study compared the effect of clean label antimicrobial ingredients on the inhibition of *Clostridium perfringens* and *Bacillus cereus* in model uncured beef and poultry products, having different moisture, pH, and salt contents, with a primary focus on extending Phase 1 cooling from 120 to 80°F. Data revealed no growth of *Bacillus cereus* in the uncured turkey or beef treatments when Phase 1 cooling was extended to 5 hours regardless of antimicrobial treatment. As excepted, *C. perfringens* grew rapidly in Control treatments without antimicrobials; populations increased over an average 2.5 logs when Phase 1 cooling was extended to three hours and populations reached stationary phase when Phase 1 cooling was extended to four or five hours. All dry vinegar and cultured sugar vinegar ingredients tested inhibited *C. perfringens* growth compared to the control without antimicrobials. Level of inhibition was similar among the four dry vinegar suppliers, with 1.25% dry vinegar sufficient to limit growth to 1-log or less in both uncured turkey and beef when Phase 1 cooling was extended to 3 hours. However, when Phase 1 cooling was extended to 5 hours, all of the formulations supported > 1-log increase even when used at a 1.25% level. Greater variation was observed among the four suppliers of cultured sugar-vinegar ingredients. All four ingredients inhibited growth of *C. perfringens* when Phase 1 cooling was extended to 3 hours when ingredients were used at 1.25%. The addition of 1.25% CSV-A and 0.75 and 1.25% CVS-D inhibited growth in turkey even when Phase 1 cooling was extended to 5 hours (15 h total cool), but inhibition was inconsistent in beef.

THANK YOU TO THE FOUNDATION'S 2023 CONTRIBUTORS

The Foundation is supported through generous contribution of companies and individuals. Company names with an asterisks (*) indicate NAMI Board of Directors companies. 2023 fundraising efforts are now underway.

Ambassador Meat Distributors, Inc.
American Beef Packers, Inc.
American Custom Meats, LLC
American Foods Group, LLC.*
Susan Backus
Bar-S Foods (Sigma)*
Brown Packing Co., Inc.*
Brush Meat Processors, LLC.
Burnett & Son Meat Co., Inc.
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Perdue Premium Meat Co.*
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FOUNDATION EDUCATION SCHEDULE

Animal Care and Handling Conference
May 25 - 26, 2023
Kansas City, MO

Advanced *Listeria monocytogenes* Intervention and Control Workshop
June 7 - 8, 2023
Kansas City, MO

Meat Industry Food Safety Conference
August 17 - 18, 2023
Grand Hyatt Denver, CO

Click here to learn more about these events, or visit www.meatinstitute.org and click the Events tab on the navigation bar.

2023 RESEARCH ADVISORY COMMITTEE MEMBERS

The Foundation's Research Advisory Committee (RAC) develops meat and poultry research priorities which serve as the basis for the Foundation's research agenda and also communicates the areas of greatest research needs to the government, public and interested stakeholders. The RAC is made up of four subgroups across minimally processed (fresh) meat and poultry safety, further processed meat and poultry safety, nutrition sciences and product quality.

Emily Arkfeld, Triumph Foods
Sharon Beals, CTI Foods
Chris Bodendorfer, Johnsonville Sausage
Melissa Bonorden, Hormel Foods Corporation
Ted Brown, Cargill, Inc.
Zach Cameron, Tyson Foods, Inc.
Anna Carlson, Cargill, Inc.
Kaitlyn Compart, Smithfield Foods
Kyle Donnelly, Empirical Foods
Wade Fluckey, Clemens Family Corporation
Heather Fowler, National Pork Board
John Handley, III, OSI Group

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Pat Mies, National Beef Packing Co.
Cindy Moore, Tyson Foods, Inc.
Sue Schwartz, Ed Miniat, LLC
Subash Shrestha, Cargill, Inc.
Sally Staben, Hormel Foods Corporation
Ben Stellmacher, Johnsonville Sausage, LLC
Tommy Wheeler, USDA, ARS, U.S. Meat Animal
    Research Center
Barry Wiseman, Triumph Foods

2023 BOARD OF DIRECTORS

The Foundation for Meat and Poultry Research and Education is governed by a Board of Directors, which provides scientific leadership and financial oversight, and acts upon recommendations from the Foundation's Research Advisory Committee. The North American Meat Institute's Executive Board is afforded the opportunity to serve on the Foundation's Board of Directors or appoint a designee to serve on their behalf. In an effort to broaden the scope of influence and direction, representatives from the livestock (beef, pork, poultry and egg), retail, academic, government agency and consumer sectors, among others, are invited to serve on the Board of Directors. Terms are for one year.

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John Vatri, Cardinal Meat Specialists
Dennis Vignieri, Kenosha Beef International, Ltd.
Russ Yearwood, Indiana Packers Corporation
Jennifer Williams, Tyson Fresh Meats

Creating Alternative Support for Lethality and Stabilization for Heat Treated and Fully Cooked Meat and Poultry Products, University of Wisconsin, HansonTech
Nearly all meat processors in the United States utilize USDA, FSIS Appendices A and B to ensure adequate thermal lethality and stabilization is achieved for partially and fully cooked products. Through the development and release of updated versions in 2017 and 2021, and the realization that a host of potential food safety vulnerabilities exist, the widespread usefulness and in-plant practical application of these guidance documents has become a significant concern and practical challenge to implement. The primary objective of this study is to develop a scientific-based, regulatory-supported, and industry-useful thermal processing and cooling resource (*e.g.* cooking and cooling food safety handbook) for validating pathogen destruction and control, and regulatory compliance for partially and fully cooked meat products that can be used in conjunction with or in lieu of USDA, FSIS Appendices A & B.
Research funded in part by the Beef Checkoff.

Revealing mechanisms for internal *Salmonella* colonization and persistence in porcine lymphoid and fat tissue, USDA-ARS-NADC - Food Safety and Enteric Pathogens Research Unit
Swine can become persistently infected with *Salmonella*, shedding little to no bacteria in the feces, until subjected to a stressful event, which increases fecal shedding. A clear understanding of the mechanisms of *Salmonella* persistence in porcine immune cells is needed to developing targeted intervention strategies to significantly reduce *Salmonella* carriage in swine and the risk of contamination of products and the environment. The overall hypothesis is that *Salmonella* resides in myeloid-lineage cells in porcine lymphoid tissues and fat, and subsequently modulates the cellular state to limit bacterial clearance. The objectives of this project is to identify the cell types harboring *Salmonella* in pig lymphoid and adipose tissue at various stages of colonization; characterize the cellular response; and identify mechanisms of intracellular colonization.
Research funded in part by the National Pork Checkoff.

Leveraging a current market hog lymph node study to further understand *Salmonella* transmission and internal colonization, Kansas State University, Texas Tech University, Triumph Foods
This project will probe a possible relationship between *Salmonella* antibodies in oral fluids and internal colonization of market hog carcasses by determining if antibody testing of oral fluids can be used as an effective antemortem screening tool to assess a group/lot of pigs for *Salmonella* risk. Further, it will characterize internal colonization within market hogs by detecting and enumerating *Salmonella* in lymph nodes and tonsils, cecal contents, spleen, and oral fluids.
Research funded in part by the National Pork Checkoff.

Effects of proportioning meat and plant-based protein-rich foods within the U.S. Healthy Eating Pattern on cardiovascular disease risk factors, Purdue University
This project will assess the effects of consuming different proportions of red meat and plant-based, protein-rich foods incorporated into a U.S. Healthy Eating Pattern on cardiovascular disease risk factors in adults at high risk of developing a heart-related disease.
Research funded in part by the Beef Checkoff.

Development and validation of an antimicrobial database to predict microbial load reduction on raw pork components against *Salmonella*, University of Illinois at Urbana-Champaign

This study will implement a high-throughput miniature assay to evaluate *Salmonella* reduction after pork carcass wash with antimicrobial treatments. Response surface methodology will be used to determine synergistic or antagonistic interactions between antimicrobials and optimize combinations to reach desired *Salmonella* reductions. The results are intended to validate the predicted interactions between antimicrobials in laboratory experiments, as well as build an antimicrobial database in which additional antimicrobial treatments data can be added as new compounds become relevant against *Salmonella* in pork.
Research funded in part by the National Pork Checkoff.

Exploring the use of Probicon as a direct-fed microbial to reduce the *Salmonella* burden in market hogs, Kansas State University, USDA-ARS-U.S. Meat Animal Research Center, Triumph Foods

This study will evaluate the influence of direct fed microbials (DFM) on pig performance, morbidity, and mortality throughout the feeding period. The feces and mesenteric lymph nodes of market hogs fed a control or DFM augmented diet will be collected to establish the impact of each diet on *Salmonella* internalized in the lymphatic system. By determining *Salmonella* serotype and presence of highly pathogenic *Salmonella* (HPS), it evaluates whether *Salmonella* diversity and/or presence of HPS is impacted by probiotic administration.
Research funded in part by the National Pork Checkoff.

A Cross-Sectional Investigation of *Salmonella* in Market Hog Lymph Nodes, Kansas State University, Texas Tech University, Triumph Foods, LLC, Smithfield Foods, Inc., JBS Foods, Clemens Food Group

A cross-sectional study design will investigate the prevalence and concentration of *Salmonella* in up to 6 lymph nodes and tonsils of market hogs. Prevalence and concentration data will be subsequently used to design a risk-assessment mapping of the carcass for prioritization of node-removal for pathogen control. The study also intends to address knowledge gaps regarding *Salmonella* prevalence by region and/or season in the United States.
Funded in part by the National Pork Checkoff.

Tests of *Salmonella* Sub-unit Proteins as Vaccines for Broiler Chickens, USDA-ARS U.S. National Poultry Research Center

This project will identify the *Salmonella* protein antigens able to induce humoral immune response in broilers, and consequently these antibodies can prevent *Salmonella* colonization in the broiler gastrointestinal tracts.

Enhanced Characterization of Sequence Differences Among *Salmonella* isolates within SNP Clusters Identified by the NCBI Pathogen Detection System, USDA-ARS, Meat Animal Research Center
This research intends to better understand the full picture of relatedness within critical *Salmonella* serovars of interest by performing a comparative genomic analyses on currently available data within the Pathogen Detection Isolates Browser (PDIB). An analysis pipeline will be developed to catalogue *Salmonella* SNP cluster diversity in the NCBI PDIB with the goal of producing a white paper to enhance industry use and understanding of this tool, and to enhance public health actions and general understanding of *Salmonella* genomics by identifying isolates for closed genome sequencing that are within 50 SNP differences.

Novel TaqMan assays for the specific detection and simultaneous differentiation of virulent and avirulent non-O157 Shiga toxin-producing *Escherichia coli* strains, Florida State University, USDA-ARS, U.S. Meat Animal Research Center
This study intends to standardize six multiplex TaqMan assays for the identification of virulent strains of *E. coli* O26, O111, O45, O103, O121, and O145 serogroups. Further, it will demonstrate the applicability of the standardized assays in inoculated food samples and red meat enrichments from national red meat surveillance programs through a direct comparison with the FSIS MLG 5C.01 reference method.

Risk assessment model to assess the impact on public health of pork based on the contamination level and presence of highly virulent or multidrug resistant strains, University of Minnesota
This project will build upon a risk assessment model developed using existing FSIS prevalence and enumeration data to assess the impact of raw pork characterized by contamination level and presence of highly virulent or multidrug resistant strains on public health. Results of this model could evaluate potential impact on public health of model performance standards based on *Salmonella* spp. enumeration level and strain characteristics to reduce the number of human cases due to pork consumption.

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